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# SYNOPSIS OF NORTH-AMERICAN INVERTEBRATES.

## IX. THE SCORPIONS, SOLPUGIDS, AND PEDIPALPI.

NATHAN BANKS.

THESE three groups belong to that order of the Arachnida known as the Arthrogastra. It may be separated from the other arachnids of the United States, and practically of the whole world, in the following manner :

Abdomen plainly segmented, palpi of male not modified for a genital organ, rarely of small size, no jointed abdominal spinnerets	<i>Arthrogastra</i>
Abdomen not plainly segmented, joined to the cephalothorax by a slender pedicel, palpi of male modified for a genital organ, at least one pair of jointed abdominal spinnerets . . . . .	<i>Araneida</i>
Abdomen not plainly segmented, broadly united to cephalothorax, no jointed spinnerets, male palpi not modified, of small or even minute size	<i>Acarina</i>

The three groups of the Arthrogastra treated in this paper are easily distinguished by the following characters :

1. Abdomen ending in a poison sting, base of abdomen beneath bearing a pair of appendages with teeth (pectines) ; palpi chelate at tips, legs without patellæ ; posterior part of abdomen much narrower than the anterior part . . . . . *Scorpionida*  
Abdomen not ending in poison sting ; no pectines, palpi not chelate at tips . . . . . 2
2. Hind coxæ bearing a few T-shaped appendages, hind trochanters of two segments, no sternum, no patellæ in any legs . . . . *Solpugida*  
Hind coxæ without such appendages, hind trochanters not bisegmented, patellæ in at least some of the legs ; sternum often present, body considerably constricted between cephalothorax and abdomen  
*Pedipalpi*

### PEDIPALPI.<sup>1</sup>

The Pedipalpi are tropical animals, so that there is but a

<sup>1</sup> The *American Naturalist* will undertake to determine and return any specimen that cannot be placed in the keys, and solicits corrections and criticism for future revision.

slender representation of them within our limits. These, however, belong to the three principal groups — Tartaridæ, Phrynidæ, and Thelyphonidæ. They are all of moderate to large size; there is a patella in at least some of the legs; there are no tactile organs on the hind coxæ; the mandibles are of moderate size; the body never ends in a sting; and the palpi are never chelate at the end; the abdomen is usually elongate, and when short it is not joined broadly to the cephalothorax, as in the Phalangida.

In the Tartaridæ the thoracic segments bearing the third and fourth pairs of legs are not united to the head, as in most arachnids, but free, and their scutæ showing as separate pieces on the dorsum. The abdomen is rather slender, tapering each

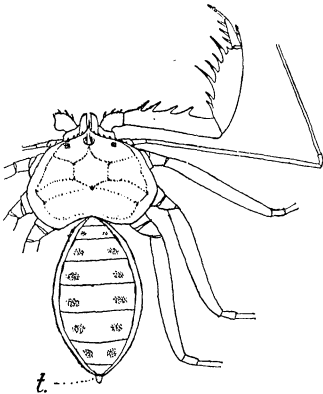


FIG. 1. — *Admetus*. *t*, telson.

way, and at tip is a long triangular telson. The palpi are short and terminate in a stout claw. The legs, except the first pair, are provided with a patella. The Thelyphonidæ are readily known by the presence of a long multiarticulate telson or tail; whence the popular name of "whip scorpions." The body is depressed and the abdomen joined broadly to the cephalothorax. Our single species, although greatly feared, is not poisonous.

The Phrynidæ are separable from the other Pedipalpi by the tenuity of the connection between the cephalothorax and abdomen. The body is broad and flat, without a tail. Of the three species recorded from our country, two are quite doubtful.

The Pedipalpi are tabulated as follows:

1. Cephalothorax transversely divided in posterior part, no eyes, telson short . . . (fam. *Tartaridæ*) *Trithyreus pentapeltis* Cook (Cal.)  
Cephalothorax entire, eyes present . . . . . 2
2. Abdomen with a long multiarticulate telson, abdomen quite broadly united to cephalothorax . . . . . (fam. *Thelyphonidæ*)  
*Mastigoproctus giganteus* Lucas (Tex., Fla., Ariz.)  
Abdomen lacking long telson, joined to cephalothorax by slender pedicel . . . . . (fam. *Phrynidæ*) 3

3. Frontal border of cephalothorax with long teeth, only two long spines on upper inner edge of tibia of palpus

*Acanthophrrynus coronatus* Butl. (Cal.)

Frontal border of cephalothorax only denticulate, more than two long spines on upper inner edge of tibia of palpus, smaller species 4

4. Between the two longest spines of tibia of palpus there are two small spines . . . . . *Admetus fuscimanus* Koch (Fla.)

Between the two longest spines of tibia of palpus is only one short spine  
*Admetus whitei* Gerv. (Tex.)

### SCORPIONIDA.

The scorpions are readily known from all other arachnids by the presence of two peculiar characters; the body terminates in a poison sting, and on the venter, near base of abdomen, is a pair of appendages, each bearing a number of lamellæ; these are the pectines, or combs. The palpi are enlarged at tip and chelate; the claw being of three parts, *vis.*,

the hand, or basal portion, and two fingers, one movable, the other fixed. There are usually three groups of eyes. The last five segments of the body are much narrower than the others and form the cauda or tail. These segments bear ridges which are called "keels." The legs have no pa-

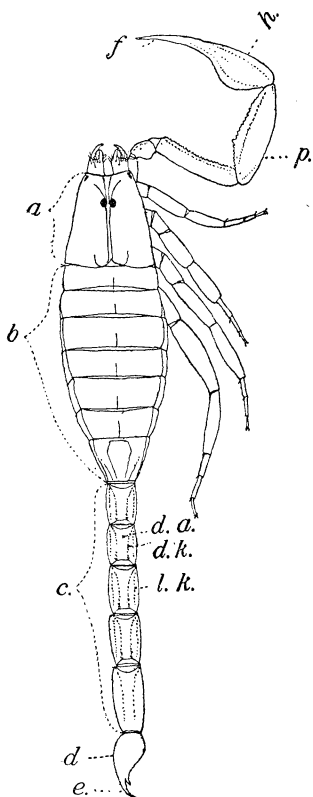


FIG. 2.—*Centruroides*. *a*, cephalothorax; *b*, abdomen; *c*, cauda; *d*, telson; *e*, sting; *p*, palpus; *h*, hand; *f*, fingers; *d.a.*, dorsal area; *d.k.*, dorsal keel; *l.k.*, lateral keel.

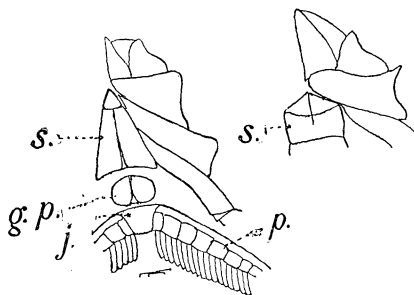


FIG. 3.—The two forms of sterna in scorpions. *s*, sternum; *g.p.*, genital plate; *j*, jugum.

tella. The exact number of species occurring in our country is uncertain, owing to the fact that several Mexican species may be found in southern Texas.

1. Only two lateral eyes; sternum broad, pentagonal; small short species  
(fam. *Chactidæ*) *Broteas alleni* Wood. (S. Cal.)  
Three to five lateral eyes . . . . . 2
2. Sternum broad, pentagonal, usually no spine under the sting . . . 3  
Sternum long, triangular, usually a spine under the sting . . . 14
3. At base of last tarsal joint at least one spur on inner and one on  
outer side; no spine under the sting . . . (fam. *Vejoviidæ*) 6  
At base of last tarsal joint only one spur, which is on the outer side;  
sometimes a hump under the sting . . . (fam. *Scorpionidæ*) 4
4. A hump under the sting . . . . . 5  
No hump under sting; cephalothorax deeply emarginate on anterior  
margin, cauda small, claws large, color dark  
*Opisthacanthus elatus* Gerv. (S. Fla.)
5. Comb with six to eight teeth . . . *Diplocentrus lesueuri* Gerv. (Fla.)  
Comb with twelve to fifteen teeth  
*Diplocentrus whitei* Gerv. (Tex., Cal.)
6. Central area of each comb divided into at least eight small pieces . . . 8  
Central area of each comb divided at most into six small pieces . . . 7
7. Movable finger with at least five small teeth, sting of ♂ as usual  
*Uroctonus mordax* Th. (West Coast)  
Movable finger with at most three small teeth, sting of ♂ swollen at  
base . . . . . *Uroctonus phaiodactylus* Wood. (Cal., Utah)
8. Penultimate tarsal joint of three front legs with long hairs on back; a  
strong tooth near the under edge of the movable mandibular fin-  
ger; very large and hairy  
*Hadrurus hirsutus* Wood. (Southwest)  
No hairs on back of these tarsal joints, no tooth near tip of under edge  
of movable mandibular finger, smaller species . . . (*Vejovis*) 9
9. Hand with distinct ridges or keels, more or less granulate . . . 10  
Hand smaller, without keels, the corners rounded and smooth . . . 12
10. On the underside of the first caudal segment the median keels are dis-  
tinct and sharp, although fine, the sting is very slender and long  
*Vejovis punctipalpi* Wood. (N. Mex., Nev.)  
On the underside of the first caudal segment there are no median keels  
or extremely indistinct, the sting of ordinary length . . . . . 11
11. Hand strongly keeled, no keels on hind tibiæ, color yellowish or green-  
ish . . . *Vejovis boreus* Gir. (Neb. to Idaho, Utah, and Nev.)  
Hand less sharply keeled, hind tibiæ with very plain keels, color uni-  
form reddish-brown, legs paler . . . *Vejovis mexicanus* Koch (Tex.)
12. On under side of first caudal segment the median keels are plain, but

not indicated by black lines, hand very slender, the fingers longer than in *Vejovis spinigerus*, color uniform yellowish

*Vejovis flavus* Bks. (N. Mex.)

On underside of first caudal segment no median keels, or at most only indicated by black lines . . . . . 13

13. Underside of cauda not very dark, the keels all indicated by black lines, palpi usually yellowish

*Vejovis spinigerus* Wood. (Tex., Ariz., Cal.)

Underside of cauda, with the whole of dorsum and the palpi dark reddish-brown; no black lines indicating the keels on cauda, smaller than the preceding . . . *Vejovis carolinus* Koch (S. C. to Tex.)

14. A tarsal spur at end of the first tarsal joints of legs 3 and 4

(fam. *Buthidae*)

Pale; no spine under sting, teeth on finger of palpus in many oblique rows, with stouter teeth at end of each and to one side; thirty to thirty-five teeth in combs, under keels of last caudal segment very strongly toothed . . . *Uroplectes mexicanus* Bks. (Tex., Cal.)

No tarsal spur at apex of first tarsal joints, usually a spine under the sting . . . . . (fam. *Centruridae*) 15

15. The oblique rows of teeth on the finger of palpus have on each side a parallel row of minute teeth . . . . . (*Centrurus*) 17

No parallel rows each side . . . . . 16

16. The ends of the oblique rows of teeth overlapping, a distinct spine under sting, twenty to twenty-two teeth in comb, color dark red brown . . . . . *Tityus floridanus* Bks. (S. Fla.)

The ends of the rows not overlapping but often connected in one direct line, cauda and palpi very long and slender

*Isometrus maculatus* De Geer (S. Fla.)

17. No spine under the sting, cauda very long and slender

*Centrurus exilicauda* Wood. (Cal.)

At least a small spine or tubercle under the sting, cauda less slender 18

18. Body vittate with black and yellow . . . . . 22

Body nearly uniform reddish-brown or blackish . . . . . 19

19. Body a dark greenish-black, cephalothorax very rough, cauda strongly granulate . . . . . *Centrurus nigrescens* Pock (Tex.)

Body reddish or yellowish brown . . . . . 20

20. Fingers paler than hand, yellowish, otherwise dark red brown, spine under sting often small and blunt *Centrurus margaritatus* Gerv. (Fla.)

Fingers usually darker than hand . . . . . 21

21. Color yellowish-brown, combs with rarely more than twenty-four teeth, spine under sting not very prominent

*Centrurus testaceus* De Geer (S. Fla.)

Color reddish-brown, combs with usually more than twenty-five teeth, spine under sting well developed, usually much larger than the preceding . . . . . *Centrurus gracilis* Gerv. (Fla.)

22. A small pale median spot on the anterior border of the cephalothorax, legs pale yellow, cauda pale

*Centrurus carolinianus* Beauv. (S. States)

No such median spot on anterior margin of the cephalothorax, legs marmorate with brown, cauda brown, dark stripes on cephalothorax, broader than in preceding . . . *Centrurus hentzi* Bks. (Fla.)

### SOLPUGIDA.

These curious arachnids are strongly separated from all other groups by various characters. There is a pair of thoracic stigmata; the cephalothorax is divided into three parts, the posterior two not covered with a chitinous shield; the mandibles

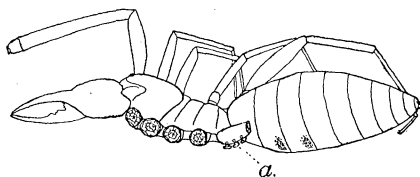


FIG. 4. — *Eremobates*. *a*, coxal appendages.

are very large and porrect; the hind coxæ bear several *T*-shaped appendages; the hind trochanters are bisegmented; the coxæ are approximate, so that there is no sternum. The body is not depressed in the slightest—a rare character in the other Arthrogastra (except Phalangida).

The species live in wild desert, often sandy, regions, and wander chiefly at night. Our genera and species may be tabulated as below.

1. Anterior margin of the cephalothorax rounded, sloping each side  
(*Ammotrecha*) 9<sup>1</sup>  
 Anterior margin truncate . . . . . (*Eremobates*) 2<sup>2</sup>
2. Movable finger of ♂ mandibles with two large subequal teeth with denticles between them . . . . . 3  
 Movable finger with but one large tooth, others much smaller . . . . . 4
3. Some short conical spines under tibia of the palpus in both sexes  
*Eremobates sulphurea* Sim. (Colo., N. Mex.)  
 No such spines under tibia in either sex  
*Eremobates formicaria* Koch (N. Mex.)

<sup>1</sup> *Ammotrecha*, *n.n.* for *Cleobis* Simon (1879), not Dana (1847).

<sup>2</sup> *Eremobates*, *n.n.* for *Datames* Simon (1879), not Stal (1875).

4. Movable finger of ♂ mandibles constricted from below near apical third  
*Eremobates californica* Sim (Ariz., Cal.)  
 Movable finger not constricted from below . . . . . 5
5. The movable finger near apical fourth is suddenly narrowed from above,  
 very large species . . . . . *Eremobates cinerea* Putn. (Ariz.)  
 The movable finger, if narrowed from above, it is much before the  
 apical fourth . . . . . 6
6. Only slender hairs on inner side of femur and tibia of ♂ palpus  
*Eremobates pallipes* Say (Kan., Tex., Colo., Wy.)  
 Spine-like bristles on inner side of femur and tibia of ♂ palpus 7
7. Upper finger stouter than usual, narrowed near tip, a small tooth near  
 middle of movable finger, tips of palpi black  
*Eremobates magna* Hanc. (Tex., Ariz.)  
 Upper finger slender throughout, no tooth near middle of movable  
 finger . . . . . 8
8. Small conical spines on underside of tibia of ♂ palpus  
*Eremobates formidabilis* Sim. (Cal., Ariz.)  
 No such spines on tibia of ♂ palpus  
*Eremobates putnami* Bks. (Cal.)
9. Lower finger of mandibles finely, but distinctly, denticulate beyond  
 large teeth; a broad dark band on middle of metatarsus of palpus  
*Ammotrecha californica* Bks. (Cal.)  
 Lower finger not denticulate . . . . . 10
10. Upper finger with a very plain ridge above at base, below there are  
 several small teeth followed by three large subequal teeth  
*Ammotrecha peninsulana* Bks. (Ariz.)  
 Upper finger with less distinct ridge, below there are two large teeth, a  
 small one, then a large one . . . *Ammotrecha cubæ* Lucas (Fla.)